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AIRS Science Team Meeting

Status of the V5 Cloud Cleared and AIRS Only Regressions

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Outline

- What's new since V4
- Cloud Cleared Regression Status
- Cloudy Regression (AIRS-Only) Status
- Future Work

What's New Since V4

- Updated Surface Emissivity Coefficient

- Cloudy Regression
  - Generate the coefficient (Feb. 2004)
  - Implemented and tested in NOAA
  - Installed into JPL (July 2005)
  - Generated coef. trained using George's PLR test and delivered to JPL.

What's New Since V4 (2)

- Bug Fix:
  - Changed the T(p) routine to splice the UARS climatology above 1.5 mb.
  - Fixed the bottom temperature and moisture for topography.
  - Turned off the AMSU adjustment for total precip. water.

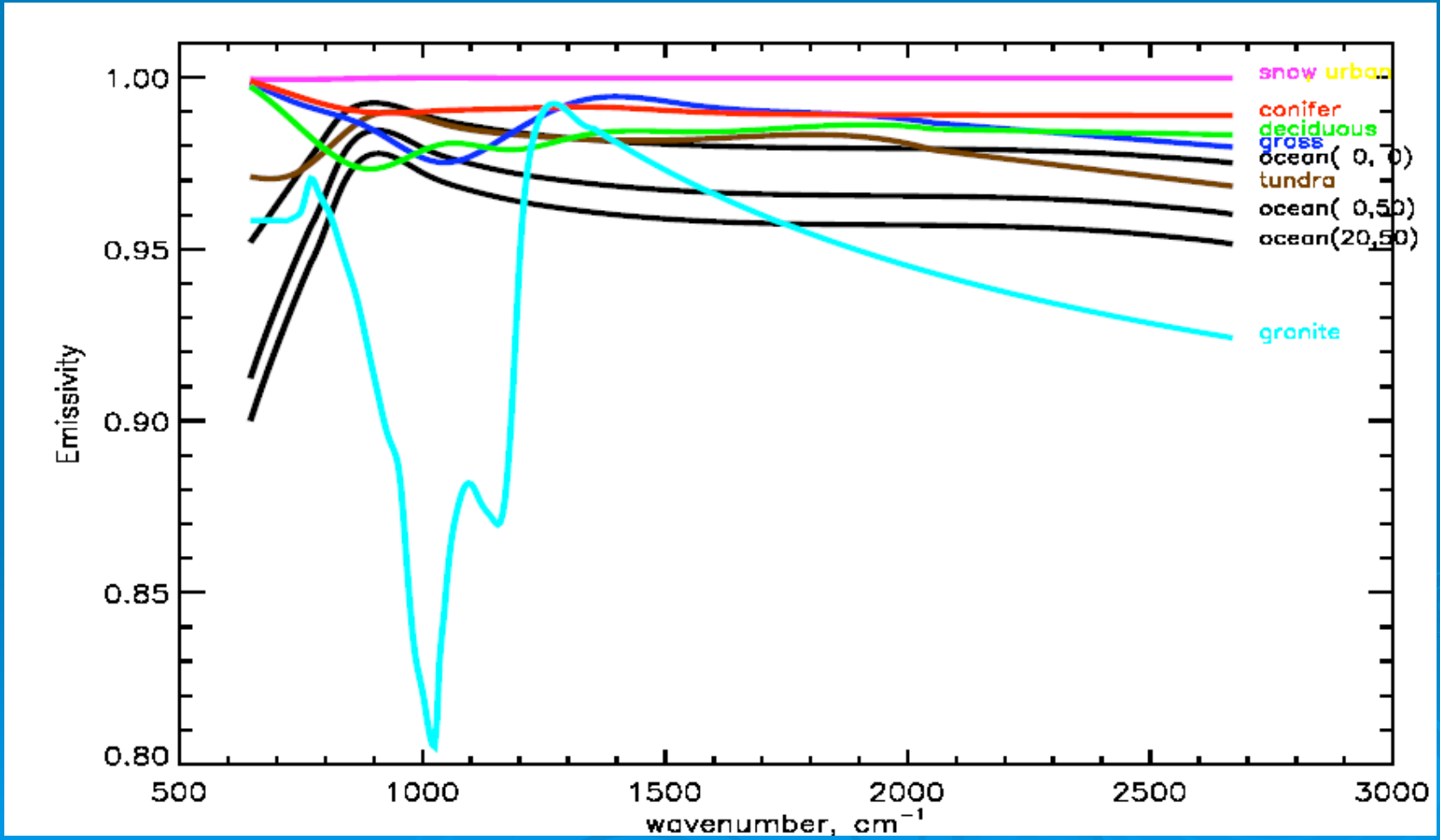
NOAA Surface Regression

- A synthetic regression is used to derive the surface emissivity coefficients
  - Infrared radiance computed from the ECMWF forecast
  - Surface emissivity model
  - Different surface conditions

NOAA Surface Regression V4

- Based on AIRS Level 2 Simulation System (AL2SS) surface model
  - 2 soil types
  - 3 vegetation types
  - Two types of ice: snow and ice
  - Each footprint is a mixture of components based on NDVI and IGBP surface types

Spectra from AL2SS:



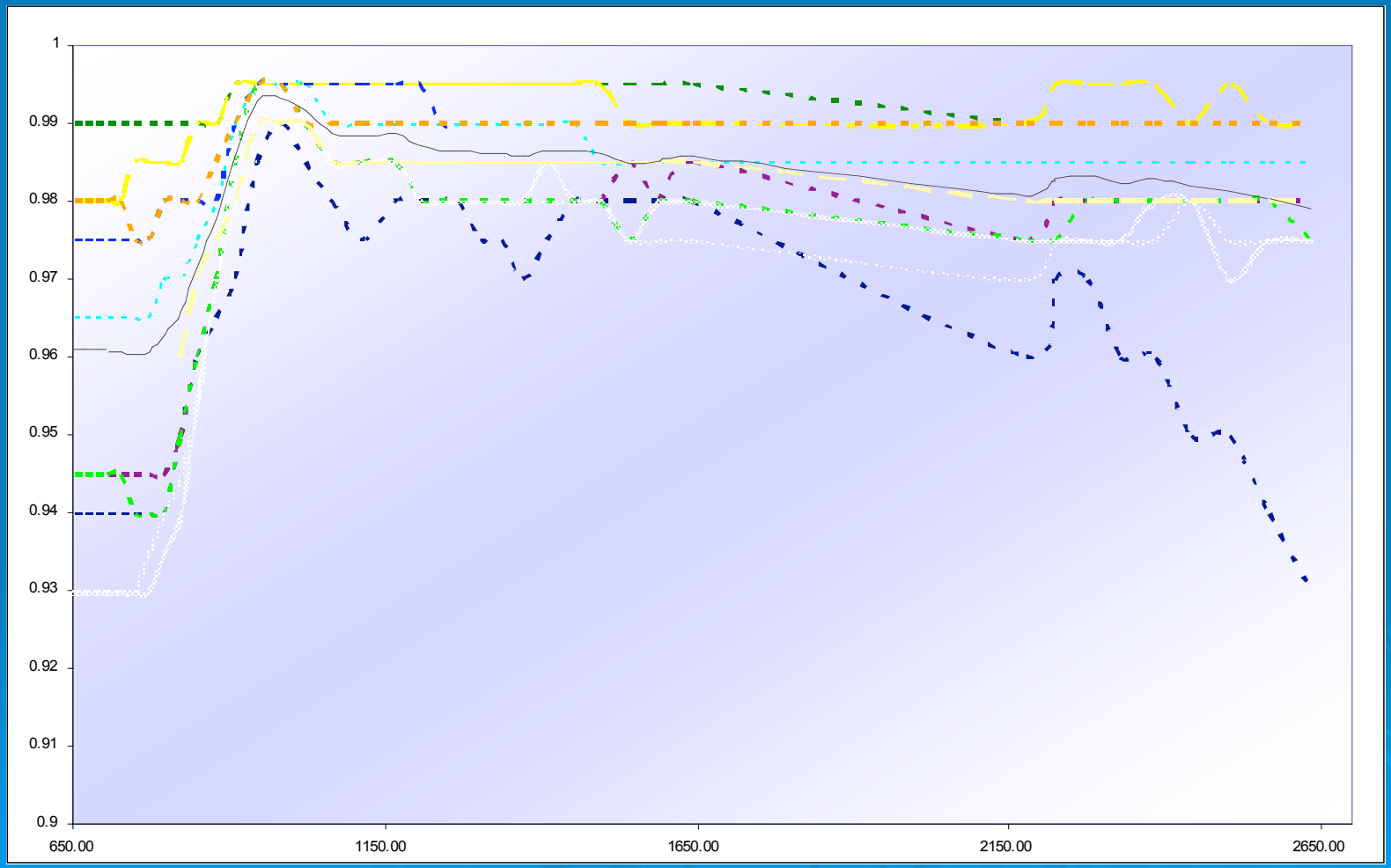
Issues with V4:

- Unrealistic snow/ice spectra used for training.
- Lack of short-wave variation in training emissivity.

NOAA Surface Regression V5

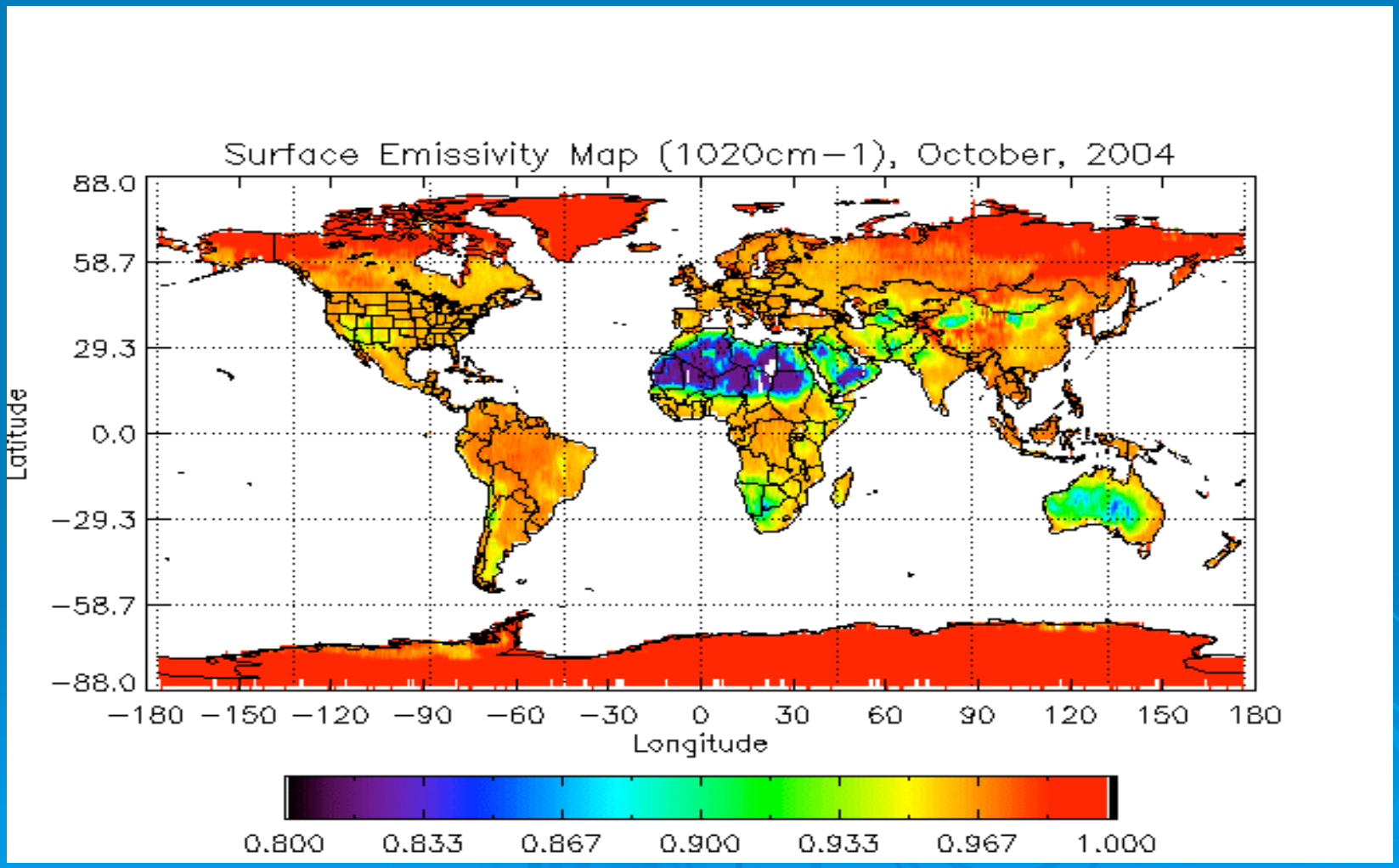
- Use the digitized observations of surface emissivity spectra, provided by NESDIS Joint Center for Satellite Data Assimilation (JCSDA).
  - 12 ice/snow spectra
  - 14 vegetation/soil spectra
  - 3 sets of coefficients generated for:
    - Unfrozen land
    - Ocean
    - Snow/Ice

Ice/Snow EMIS Spectra

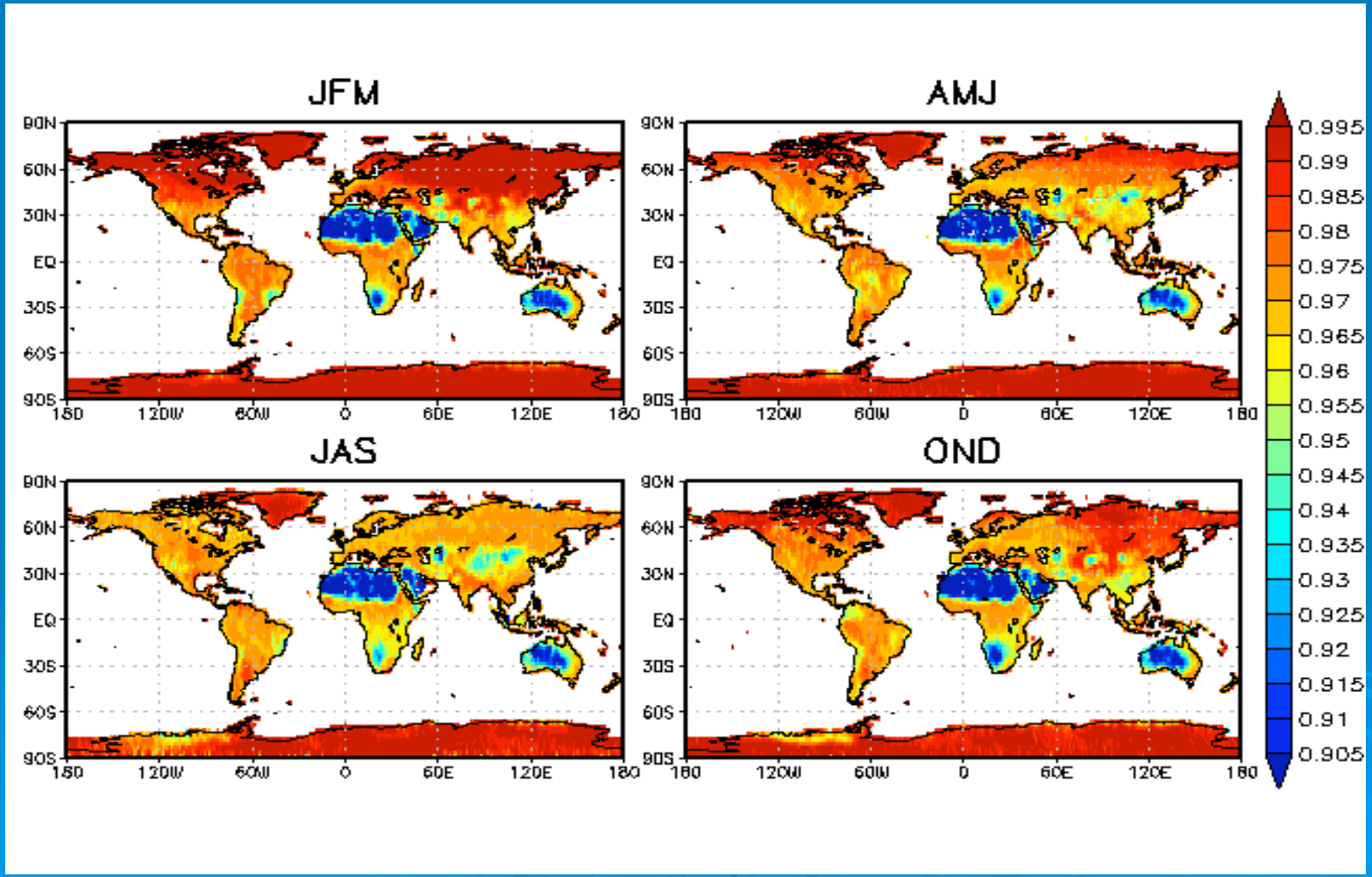


Land EMIS Spectra

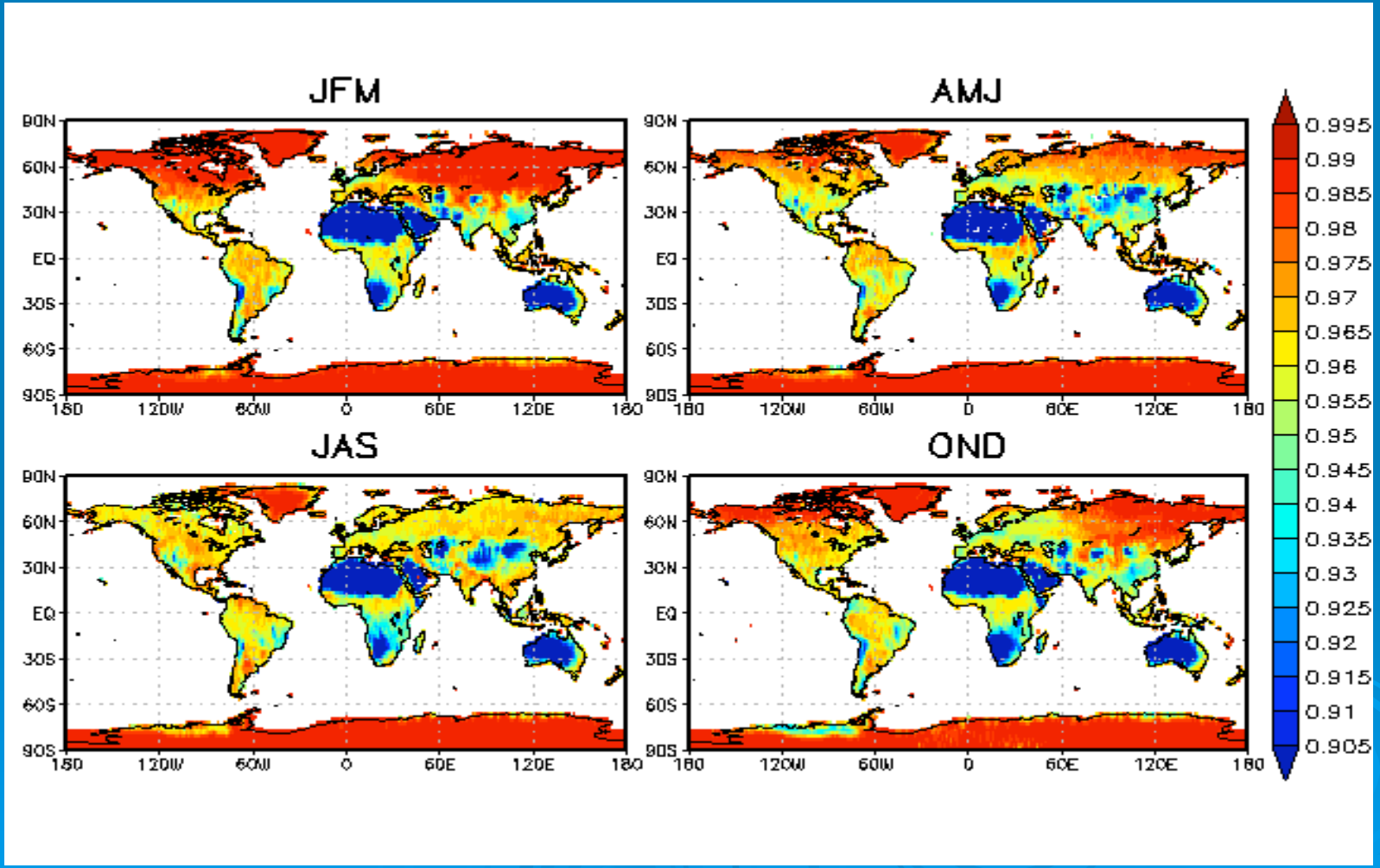
Results: Monthly Averaged Surface Emissivity



Results: Seasonal Characteristics 2005, 980 cm^{-1}



Results: Seasonal Characteristics 2005, 1120 cm^{-1}



Recent On-going NOAA Regression Emissivity Activities:

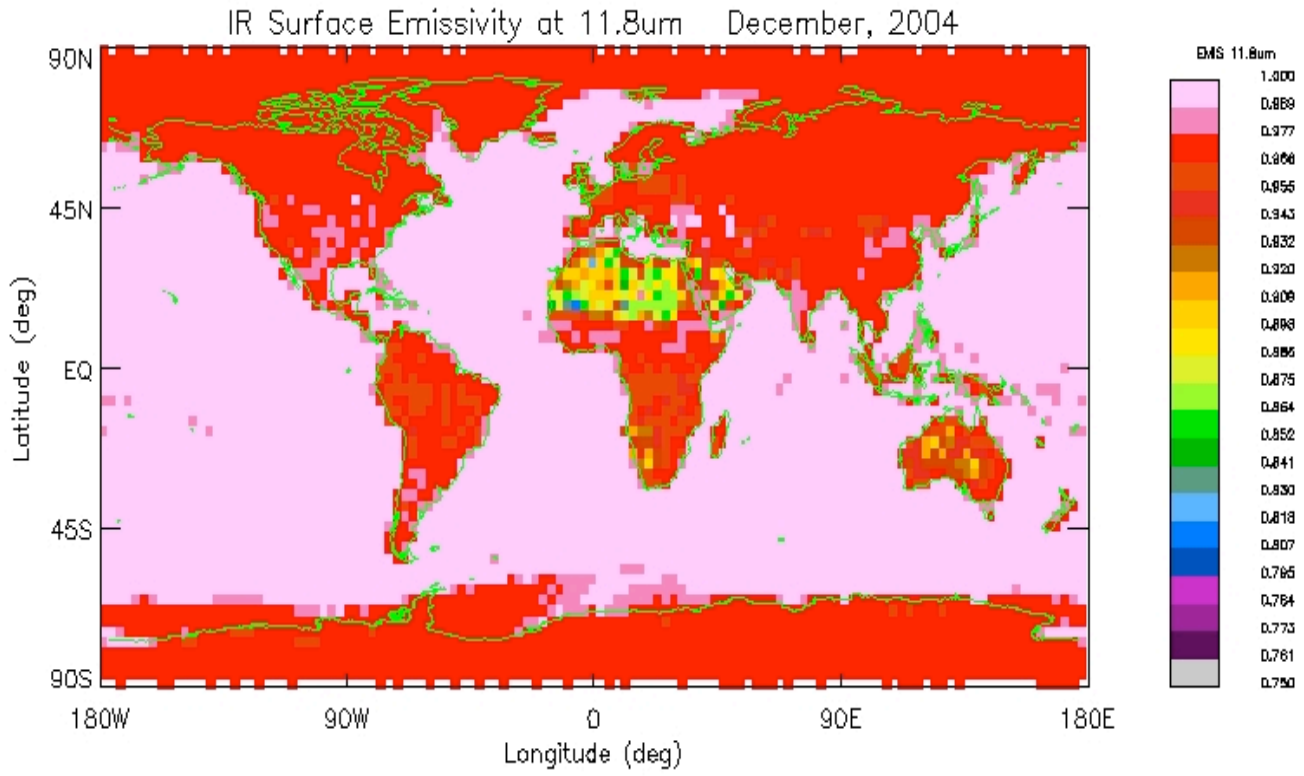
- Experiment with adding more surface types, such as desert.
- Including more channels (281 channel set).
- Joined CIMSS for inter-comparison of Surface emissivity products.
- Generating monthly emissivity maps which can be used to build the emisssivity climatology after careful analysis.

Recent On-going NOAA Regression Emissivity Activities:

- Monthly emissivity maps:
  - 3x3 global grid
  - From Aug 2003 to current
  - Reprocessing capability
  - Maps From Regression:
    - take all FOVs that ok by all steps
    - (ispare(1)=0 and ispare(2)=0)
  - Maps From Physical Retrieval:
    - amplification factor<1
    - Liquid Water value (liqwat, gm/cm2)<.001
    - NOAA PC Score < 1.

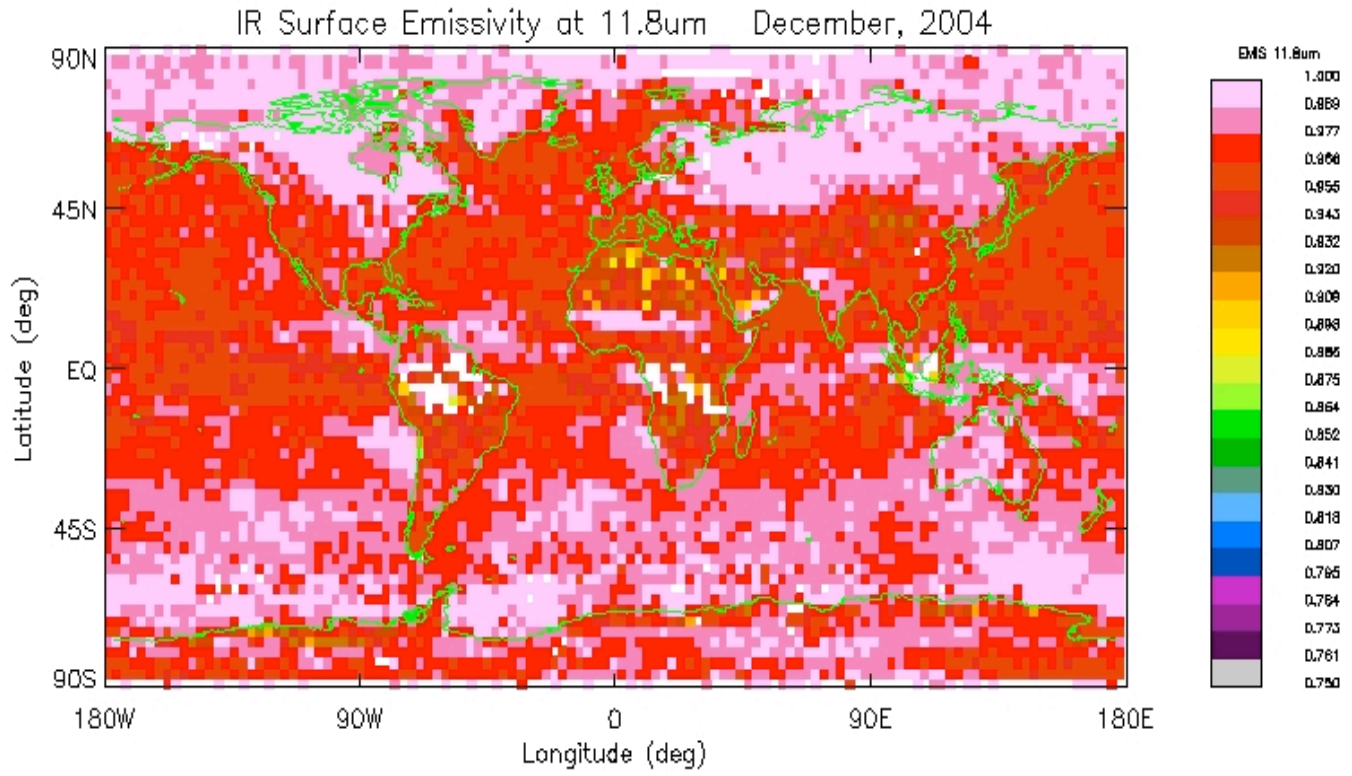
AIRS Derived Monthly Emissivity Climatology (Regression)

(By Fengying Sun) from 3x3° grids: 11.8 um (850 cm^{-1})



AIRS Derived Monthly Emissivity Climatology (Retrieval)

(By Fengying Sun) from 3x3° grids: 11.8 um (850 cm^{-1})



Cloudy Regression (1)

- Mitch came up the idea to generate regression coefficient from cloud contaminant radiances in early 2004.
- We implemented and tested the cloudy regression in NOAA offline regression system.
- Installed the cloudy regression into the JPL system in July of 2005.
- Used the same thresholds and training days for the training, as we did for the cloud cleared radiance.

Cloudy Regression Coef.(2)

- data sets :
  - Sept 6 2002, Jan 25 2003, and June 8 2003
  - cloudy radiance
- filters to the data :
  - diff<=5. (predict amsu from airs - amsu)
    score<=1.2
  - delta<15 (for 12 selected channels, abs of difference between sim and obs less than 15).

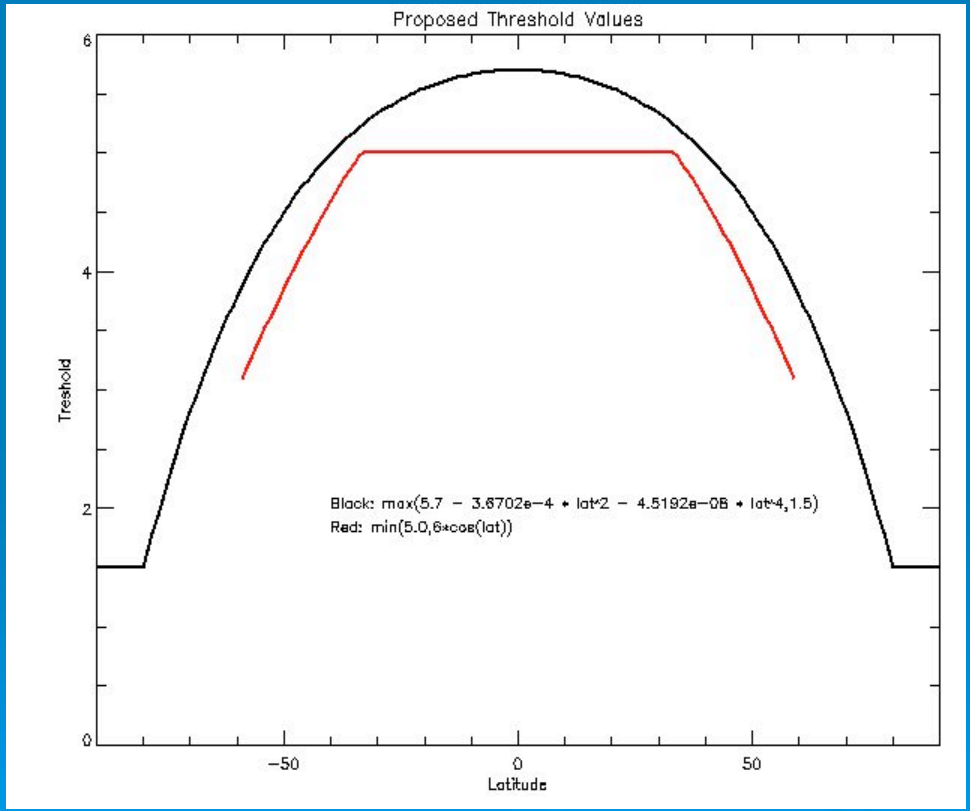
Cloudy Regression (3)

- Took recommendation from JPL to use the pseudo lapse rate test to train the regression.
- Delivered the re-trained regression coefficient to JPL in this March.

Pseodo Lapse Rate Test:

- Pseudo Lapse Rate Test (#2):
  PLR = Tb2388 - Tb2387
  PLR < min(5.0,6*cos(lat)) if abs(lat) < 60 and if topog < 2000m
- This test will be applied after all retrievals are finished
- If failed, all quality indicators, including Qual_Cloud_OLR, will be set to 2(bad, do not use for data analysis)
- But retrieved values will be kept for later debugging purpose

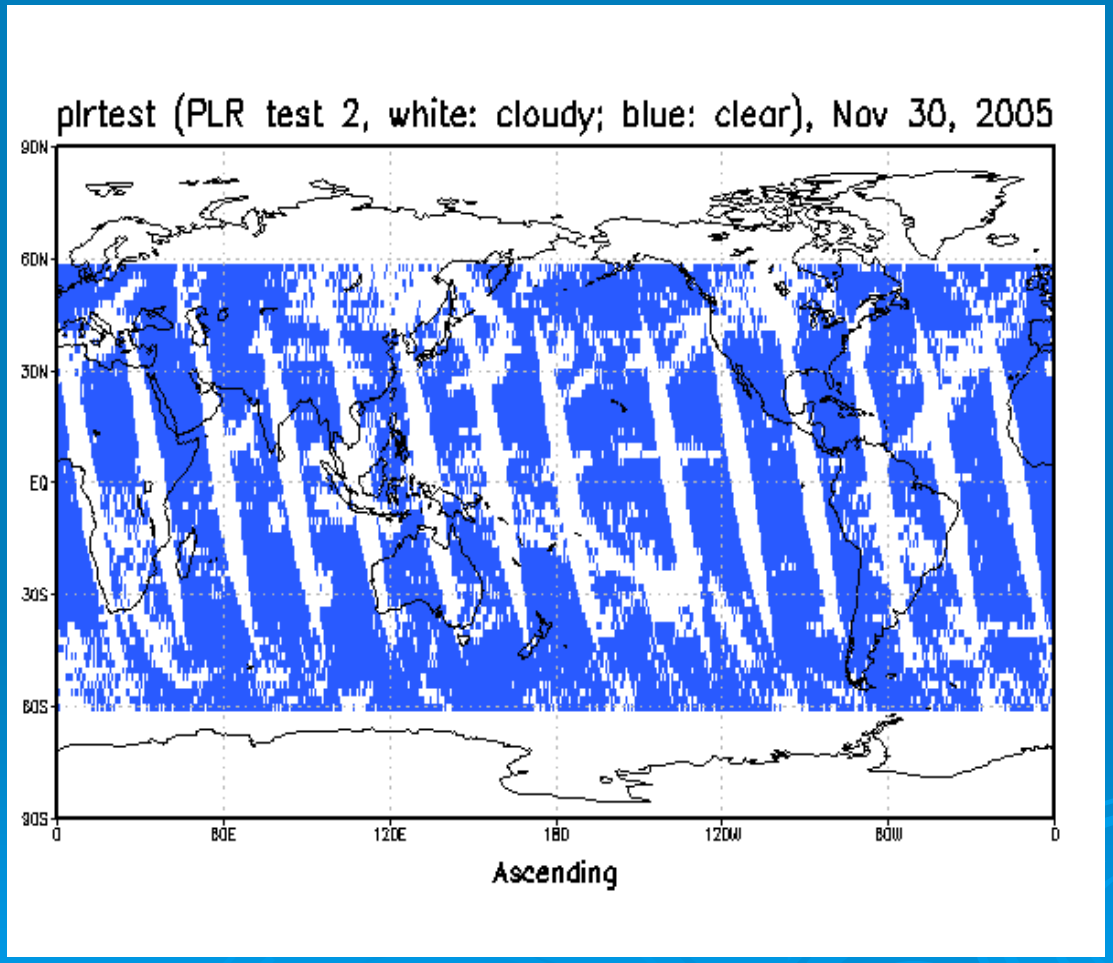
Comparison of Thresholds



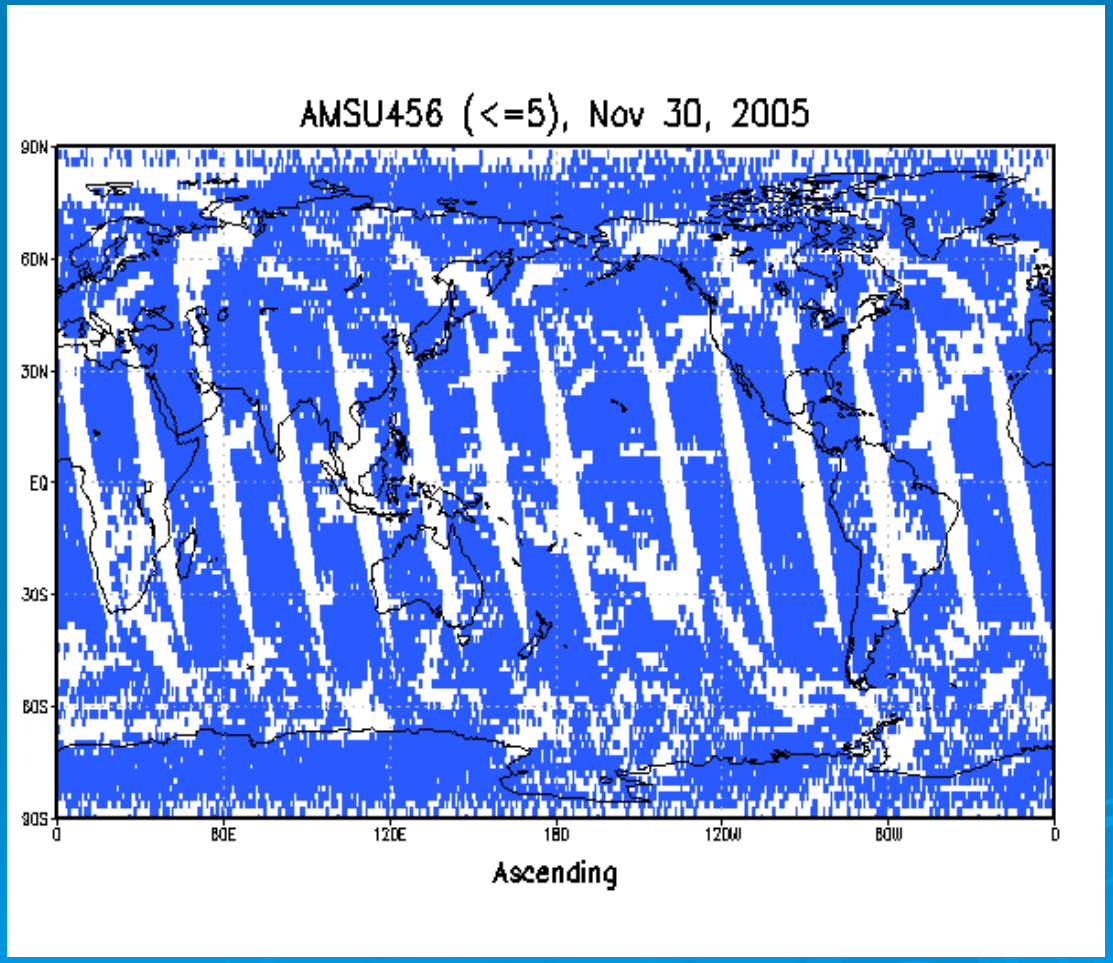
- Test 1(Black)
  - Black curve could be higher if the granule median is higher
- Test 2(Red)

Sung-Yung Lee

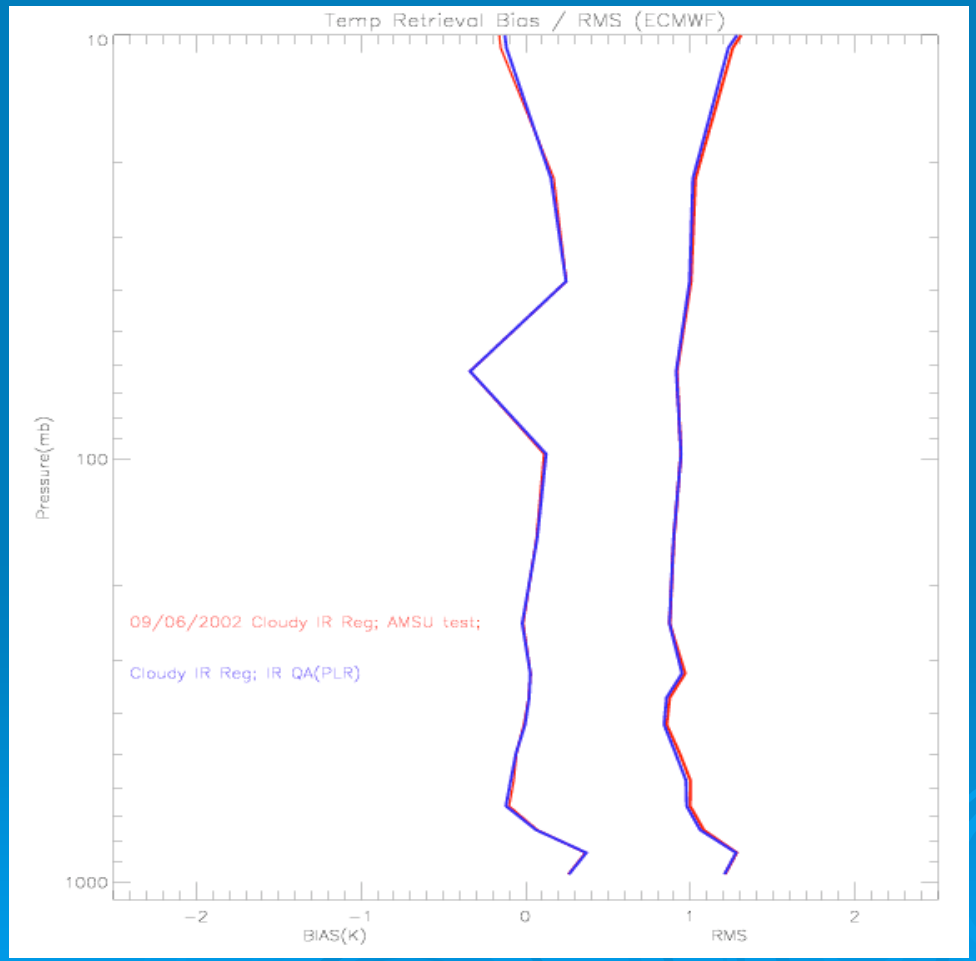
PLR Test


plrtest (PLR test 2, white: cloudy; blue: clear), Nov 30, 2005
90N
60N
30N
EQ
30S
60S
90S
0
60E
120E
180
120W
60W
0
Ascending

AMSU Diff Test



Global non-frozen Ocean, Day 'Clear', AMSU test vs PLR test:



Future Work: Plans for V6

- Continue our experiments on surface emissivity regression:
  - Adding surface type information.
  - Eigenvector regression (Bill Smith).
  - Channel sets.
  - Build a global emissivity climatology.
  - Use of MODIS as first guess.

Future Work: Plans for V6 (2)

- Improve the atmospheric regression for both cloud cleared and cloudy regression:
  - Better training:
    - Generate coef. Based on sondes (T,Q,O3).
    - Remove channels that are bad in certain epochs :
      - Epoch 1 (Before Nov 2003) and epoch 2 coef. Work well.
      - May introduce artifacts to climate studies.
    - In v6 the goal is to establish a common set for all epochs
  - Better QA:
    - identify the problematic area and develop QA schemes accordingly.
  - Extend our AIRS regression techniques to IASI and vise versa.